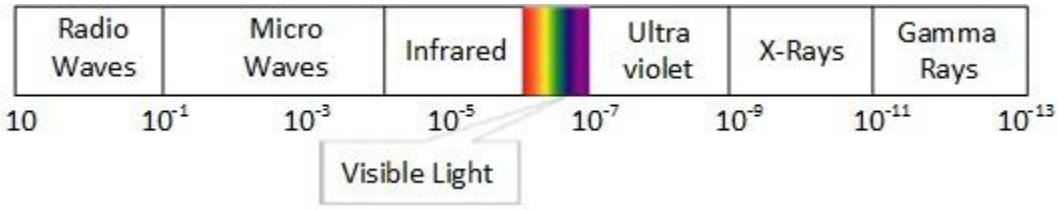
Wireless Transmission

Introduction

Wireless transmission is a form of unguided media. Wireless communication involves no physical link established between two or more devices, communicating wirelessly. Wireless signals are spread over in the air and are received and interpret by appropriate antennas.

When an antenna is attached to electrical circuit of a computer or wireless device, it converts the digital data into wireless signals and spread all over within its frequency range. The receptor on the other end receives these signals and converts them back to digital data.

A little part of electromagnetic spectrum can be used for wireless transmission.



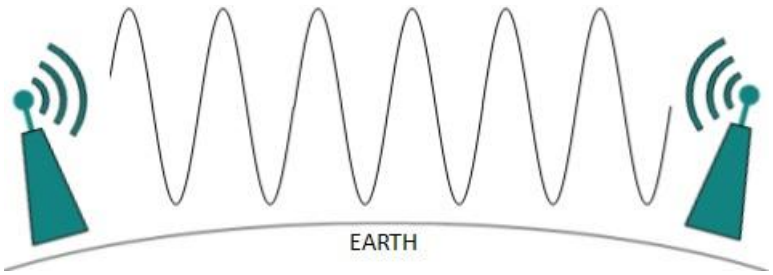
[*Image: Electromagnetic Spectrum*]

Radio Transmission

Radio frequency is easier to generate and because of its large wavelength it can penetrate through walls and alike structures. Radio waves can have wavelength from 1 mm – 100,000 km and have frequency ranging from 3 Hz (Extremely Low Frequency) to 300 GHz (Extremely High Frequency). Radio frequencies are sub-divided into six bands.

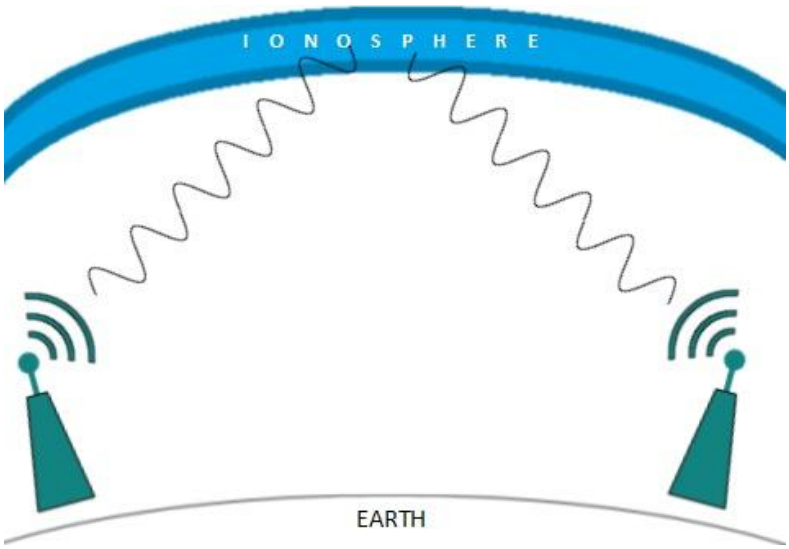
Radio waves at lower frequencies can travel through walls whereas higher RF travel in straight line and bounces back. The power of low frequency waves decreases sharply as it covers longer distance. High frequency radio waves have more power.

Lower frequencies like (VLF, LF, MF bands) can travel on the ground up to 1000 kilometers, over the earth's surface.



[*Image: Radio wave - grounded*]

Radio waves on high frequencies are prone to be absorbed by rain and other obstacles. They use Ionosphere of earth atmosphere. High frequency radio waves such as HF and VHF bands are spread upwards. When it reaches Ionosphere it is refracted back to the earth.

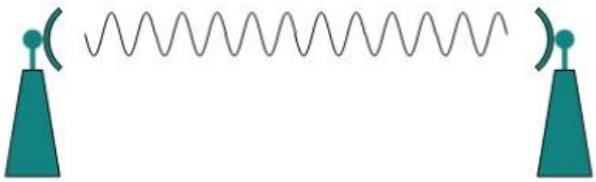


[*Image: Radio wave - Ionosphere*]

Microwave Transmission

Electromagnetic waves above 100 MHz tend to travel in a straight line and signals over them can be sent by beaming those waves towards one particular station. Because Microwaves travels in straight lines, both sender and receiver must be aligned to be strictly in line-of-sight.

Microwaves can have wavelength ranging from 1 mm – 1 meter and frequency ranging from 300 MHz to 300 GHz.



[*Image: Microwave Transmission*]

Microwave antennas concentrate the waves making a beam of it. As shown in picture above multiple antennas can be aligned to reach farther. Microwaves are higher frequencies and do not penetrate wall like obstacles.

Microwaves transmission depends highly upon the weather conditions and the frequency it is using.

Infrared Transmission

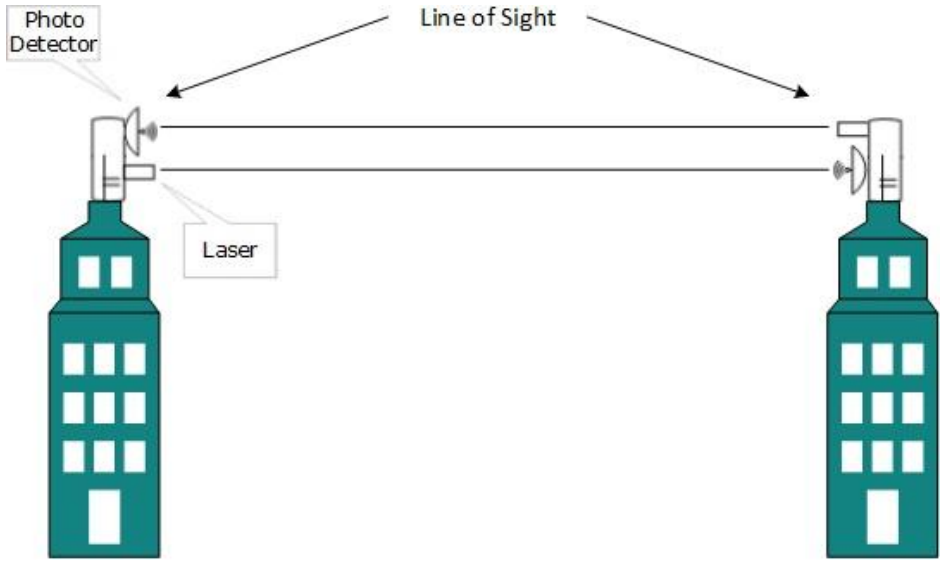
Infrared waves lies in between visible light spectrum and microwaves. It has wavelength of 700 nm to 1 mm and frequency ranges from 300 GHz to 430 THz.

Infrared waves are used for very short range communication purposes such as television and it's remote. Infrared travels in a straight line so they are directional by nature. Because of high frequency range, Infrared do not cross wall like obstacles.

Light Transmission

Highest most electromagnetic spectrum which can be used for data transmission is light or optical signaling. This is achieved by means of LASER.

Because of frequency light uses, it tends to travel strictly in straight line. So the sender and receiver must be in the line-of-sight. Because laser transmission is unidirectional, at both ends of communication laser and photo-detectors needs to be installed. Laser beam is generally 1mm wide so it is a work of precision to align two far receptors each pointing to lasers source.



[*Image: Light Transmission*]

Laser works as Tx (transmitter) and photo-detectors works as Rx (receiver).

Lasers cannot penetrate obstacles like walls, rain and thick fog. Additionally, laser beam is distorted by wind and atmosphere temperature or variation in temperature in the path.

Laser are safe for data transmission as it is very difficult to tap 1mm wide laser without interrupting the communication channel.

Source:

http://www.tutorialspoint.com/data_communication_computer_network/wireless_transmission.htm